FEL3330 Networked and Multi-Agent Control Systems 7.5 credits

Nätverk och multiagent reglersystem

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FEL3330 valid from Spring 2013

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course, the student should be able to:

- know the essential theoretical tools to cope with Networked and Multi-Agent Systems
- know the established problems and results in the area
- develop a research project and give presentations in the area
- contribute to the research frontier in the area

Course contents

Introduction, Motivation, Applications, Graph Theory, Lyapunov Functions, Logistics, etc.

Consensus: static, dynamic, distributed estimation, leader-follower architectures for consensus

Communication Constraints: connectivity, connectivity maintainance, sampling, delays, packet losses, quantization, security

Dynamics: nonholonomic, double integrator, rigid body dynamics

Formation Control: distance based formations, rigidity, persistence, position based formations, formation infeasibility

Swarming-sensor networks: sensing constraints, aggregation, dispersion, coverage control, deployment, flocking

Game theoretic approach

Collision avoidance: potential fields, navigation functions

At the research frontier

Disposition

Lectures, exercises, relevant list of papers/book chapters some of which will be selected by the participants for a 15 min oral presentation in one of the lectures, 72h take home exam.

Course literature

The course will be primarily based on the lectures (slides and blackboard). Slides of the lectures will be available online at the end of each lecture, as well as suggested reading for the topic of the lecture. Good supplementary textbooks are

Algebraic Graph Theory, by C. Godsil and G. Royle, Springer, 2001.

Graph Theoretic Methods in Multi-Agent Networks, by M. Mesbahi and M. Egerstedt, Princeton University Press, 2010.

Distributed Control of Robotic Networks, by F. Bullo, J. Cortes, and S. Martinez, Princeton, 2009.

Distributed Consensus in Multi-vehicle Cooperative Control, by Wei Ren, Randal W. Beard, Communications and Control Engineering Series, Springer-Verlag, London, 2008 (ISBN: 978-1-84800-014-8).

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Passing Grade on homeworks, presentation and exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.